

WHAT IS CLAIMED IS:

5/27
1. A control apparatus for numerical control adapted for a cutting machine having a turret which can be turned to an arbitrary position, wherein

an X-axis offset value (ΔX) and a Z-axis offset value (ΔZ) of a cutting edge of a cutting tool on coordinates with respect to said cutting machine are calculated in accordance with a turning angle of said turret, and

said X-axis offset value and said Z-axis offset value are indicated on a display.

2. A control apparatus according to claim 1, wherein an X-axis wear compensation value (ΔX_t) and a Z-axis wear compensation value (ΔZ_t) are indicated in relation to said X-axis offset value (ΔX) and said Z-axis offset value (ΔZ).

3. A control apparatus according to claim 1, wherein when said turret is turned to a turning angle (α), an X-axis value of the tool (L_2), a Z-axis value of the tool (L_1), an X-axis value of the turret (L_4) and a Z-axis value of the turret (L_3) are converted according to the following equations to calculate said X-axis offset value (ΔX) and said Z-axis offset value (Δ

Z).

$$\Delta X = (\Delta Az \cdot \cos \alpha - \Delta Ax \cdot \sin \alpha) \times 2 \quad (\text{Equation 1})$$

$$\Delta Ax = L2 + L4$$

$$\Delta Az = L1 + L3$$

$$\Delta Z = -\Delta Az \cdot \sin \alpha - \Delta Ax \cdot \cos \alpha \quad (\text{Equation 2})$$

4. A control apparatus according to claim 2, wherein when said turret is turned to a turning angle (α), an X-axis value of the tool (L2), a Z-axis value of the tool (L1), an X-axis value of the turret (L4) and a Z-axis value of the turret (L3) are converted according to the following equations to calculate said X-axis offset value (ΔX) and said Z-axis offset value (ΔZ).

$$\Delta X = (\Delta Az \cdot \cos \alpha - \Delta Ax \cdot \sin \alpha) \times 2 \quad (\text{Equation 1})$$

$$\Delta Ax = L2 + L4$$

$$\Delta Az = L1 + L3$$

$$\Delta Z = -\Delta Az \cdot \sin \alpha - \Delta Ax \cdot \cos \alpha \quad (\text{Equation 2})$$

5. A control apparatus according to any one of claims 1 through 4, wherein said cutting tool can be rotated around the tool axis to an arbitrary position,

an X-axis value (L2r) of said cutting edge of said cutting tool after a rotation of said cutting tool with a rotation angle (β) is calculated according to the

equation of $L2r = L2 \cdot \cos \beta$,

said X-axis offset value and said Z-axis offset value when said turret is turned to a turning angle (α) are calculated according to the following equations 3 and 4, and

said X-axis offset value (ΔXr) after the rotation of said cutting tool and said Z-axis offset value (ΔZr) after the rotation of said cutting tool are indicated on said display.

$$\Delta Xr = (\Delta Az \cdot \cos \alpha - \Delta Axr \cdot \sin \alpha) \times 2 \quad (\text{Equation 3})$$

$$\Delta Axr = L2 + L4$$

$$\Delta Az = L1 + L3$$

$$\Delta Zr = -\Delta Az \cdot \sin \alpha - \Delta Axr \cdot \cos \alpha \quad (\text{Equation 4})$$

6. A method of indicating an X-axis offset value (ΔX) and a Z-axis offset value (ΔZ) of a cutting edge of a cutting tool, in a control apparatus for a cutting machine having a turret which can be turned to an arbitrary position, said method comprising the steps of:

reading an X-axis value of the tool ($L2$) and a Z-axis value of the tool ($L1$) of the selected cutting tool;

reading an X-axis value of the turret ($L4$);

storing a Z-axis value of the turret ($L3$) in

memory;

reading a turning angle (α) of said turret;
 calculating said X-axis offset value (ΔX) and
 said Z-axis offset value (ΔZ) according to the
 following equations 1 and 2, employing said X-axis
 value of the tool (L2), said Z-axis value of the tool
 (L1), said X-axis value of the turret (L4) and said
 Z-axis value of the turret (L3); and

indicating said X-axis offset value (ΔX) and said
 Z-axis offset value (ΔZ).

$$\Delta X = (\Delta A_z \cdot \cos \alpha - \Delta A_x \cdot \sin \alpha) \times 2 \quad (\text{Equation 1})$$

$$\Delta A_x = L2 + L4$$

$$\Delta A_z = L1 + L3$$

$$\Delta Z = -\Delta A_z \cdot \sin \alpha - \Delta A_x \cdot \cos \alpha \quad (\text{Equation 2})$$

7. A control apparatus for numerical control adapted
 for a cutting machine in which a cutting tool is rotated
 around the tool axis thereof to an arbitrary position,
 wherein an X-axis value (L2r) of a cutting edge of said
 cutting tool on a coordinate with respect to said
 cutting machine is calculated in accordance with a
 rotation angle of said cutting tool,

an X-axis offset value (ΔX_r) after the rotation
 is obtained from the following equations employing said
 X-axis value of the tool (L2r) and an X-axis value of

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4), and

axis offset value (ΔX_r)

on a display.

$\Delta A_{Xr} \times 2$

$L2r + L4$

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compensation value (ΔY

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said Y-axis offset va

$$\Delta A_{xr} = L2r + L4$$

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according to claim 7 or 8,
value (ΔY) of said cutting edge
ordinates with respect to
calculated in accordance with
said cutting tool, and
compensation value (ΔX_t) and a
value (ΔY_t) are indicated in
offset value (ΔX_r) after the
offset value (ΔY).

an X-axis wear compensation value (ΔX_t) and a Y-axis wear compensation value (ΔY_t) are indicated in relation to said X-axis offset value (ΔX_r) after the rotation and said Y-axis offset value (ΔY).